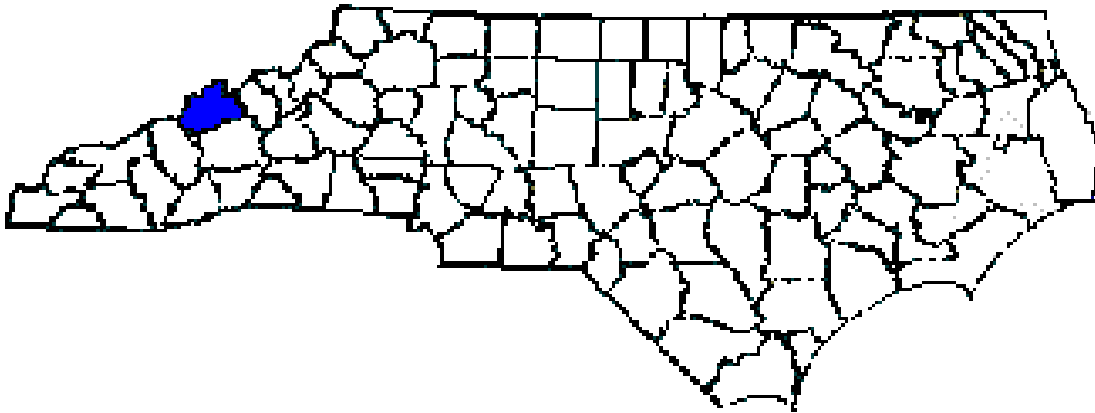
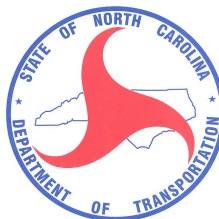


ANNUAL REPORT FOR 2012



Ivy Gap Branch Site N Mitigation Site
Madison County
TIP No. R-2518A
COE Action ID: SAW-2007-2197-357/300
DWQ #: 20071134



Prepared By:
Natural Environment Section & Roadside Environmental Unit
North Carolina Department of Transportation
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SUMMARY

The following report summarizes the stream monitoring activities that have occurred during the Year 2012 at the Ivy Gap Branch Site N Mitigation Site in Madison County. The North Carolina Department of Transportation (NCDOT) completed this project in January 2009 (Sta. 10+00 to 10+90) and May 2011 (Sta. 10+90 to 12+25). This report provides the monitoring results for the third formal year of monitoring (Year 2012). The Year 2012 monitoring period was the third of five scheduled years of monitoring on the Ivy Gap Branch Site N Mitigation Site (See Success Criteria Section 2.1).

Based on the overall conclusions of monitoring at the Ivy Gap Branch Site N, it has met the required monitoring protocols for the third formal year of monitoring on the stream and first formal year of monitoring on the planted vegetation. The channel throughout the stream relocation site is stable at this time. The eroded area noted during the 2011 (Year 2) monitoring evaluation from Sta. 11+15 to 11+20 Rt. was repaired in March 2012. The streambank and buffer area were planted in March 2012 with live stakes and bareroot seedlings. The planted vegetation is surviving at this time. NCDOT will continue stream monitoring at the Ivy Gap Branch Site N Mitigation Site in 2013.

1.0 INTRODUCTION

1.1 Project Description

The following report summarizes the stream monitoring activities that have occurred during the Year 2012 at the Ivy Gap Branch Site N Mitigation Site. Site N is located on US 19 in Madison County at Sta. 82+20 to 82+50 -L- Rt. and Sta. 82+80 to 84+20 -L- Lt. (Figure 1). The Ivy Gap Branch Site N was constructed to provide mitigation for stream impacts associated with Transportation Improvement Program (TIP) number R-2518A in Madison County.

The mitigation site provided approximately 148 linear feet of stream preservation and 581 linear feet of stream relocation. Construction was completed in January 2009 (Sta. 10+00 to 10+90) and May 2011 (Sta. 10+90 to 12+25). The stream relocation involved excavation of a new floodplain and channel, installing several in-stream cross vane structures and planting the riparian buffer zone.

1.2 Purpose

In order for a mitigation site to be considered successful, the site must meet the success criteria. This report details the monitoring in 2012 at the Ivy Gap Branch Site N Mitigation Site. Hydrologic monitoring was not required for this site.

1.3 Project History

January 2009	Construction Completed (Sta. 10+00 to 10+90)
March 2009	Site Planted (Type I only)
October 2009	As-Built Survey Completed (Sta. 10+00 to 10+90)
November 2010	Stream Channel Monitoring (Year 1)
May 2011	Construction Completed (Sta. 10+90 to 12+25)
November 2011	As-Built Survey Completed (Sta. 10+90 to 12+25)
November 2011	Stream Channel Monitoring (Year 2)
March 2012	Stream Repairs (Sta. 11+15 to 11+20 Rt.)
March 2012	Site Planted (Type I and II)
September 2012	Vegetation Monitoring (Year 1)
November 2012	Stream Channel Monitoring (Year 3)

1.4 Debit Ledger

The entire Ivy Gap Branch Site N stream mitigation site was used for the R-2518A project to compensate for unavoidable stream impacts.



Figure 1. Vicinity Map

Photo Points and Cross
Section Locations

1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365																																																																																																																																																																																																																																																																																																																																																																													

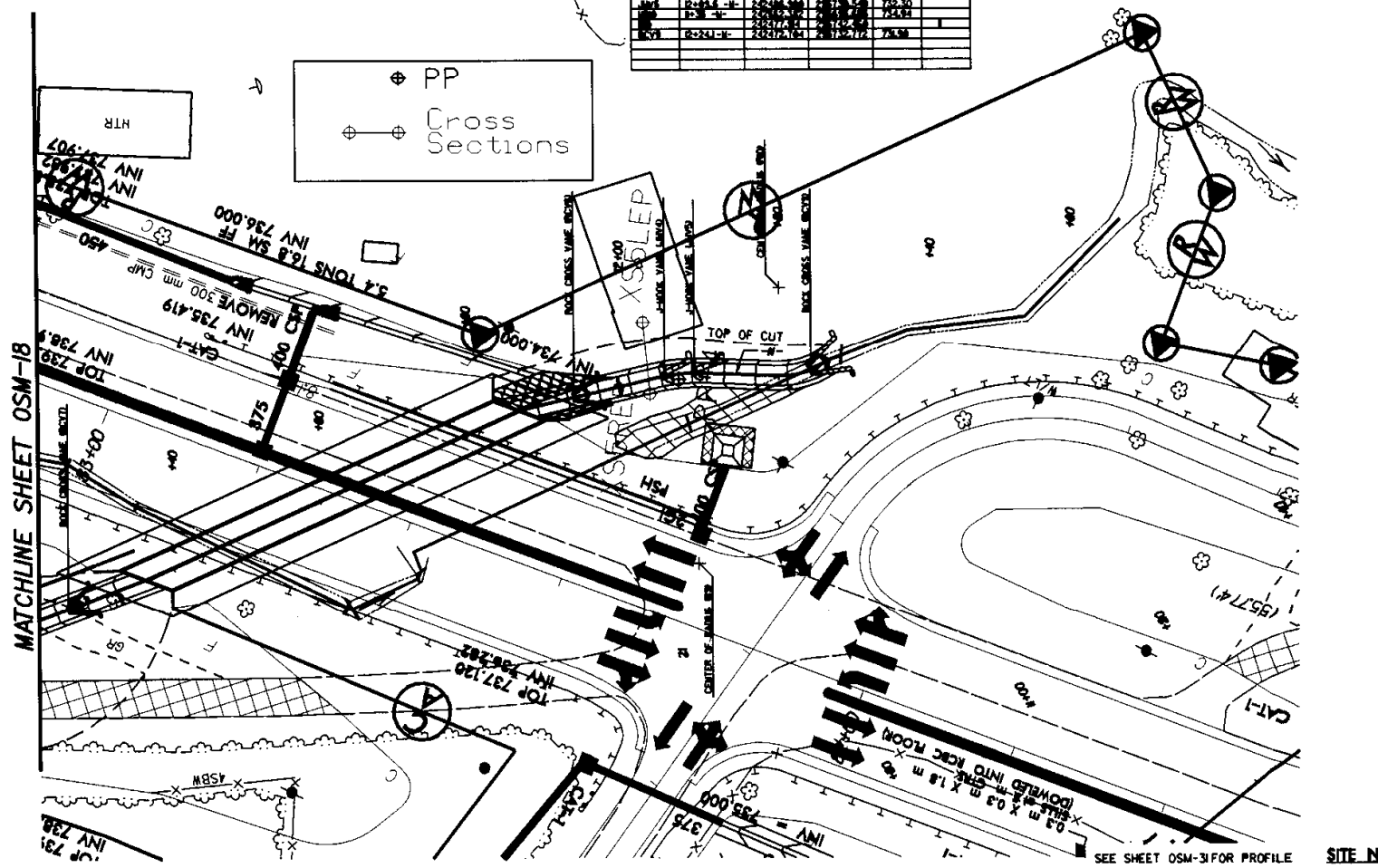


Figure 3. Site N Map

2.0 STREAM ASSESSMENT

2.1 Success Criteria

The permittee shall monitor the restoration and enhancement mitigation sites following the Level 1 protocols outlined in the "Stream Mitigation Guidelines," dated April 2003 with the following exceptions:

1. Pebble counts shall not be conducted.
2. Two cross sections shall be conducted for streams less than 500 linear feet and five (5) cross sections shall be conducted for streams greater than 500 linear feet.
3. Riparian success shall be by visual inspection of plant survival. Photos will be taken and comments noted on plant survival.

The permittee shall monitor the preservation sites by visual inspection. Photos will be taken and comments noted on plant survival. The monitoring shall be conducted annually for a minimum of five (5) years after final planting. The monitoring results shall be submitted to DWQ in a final report within sixty (60) days after completing monitoring. After 5 years the NCDOT shall contact the DWQ to schedule a site visit to "close out" the mitigation site.

2.2 Stream Description

2.2.1 Post-Construction Conditions

The stream relocation of the Ivy Gap Branch Site N Mitigation Site involved excavation of a new floodplain and channel, installing several in-stream cross vane structures and planting the riparian buffer zone.

2.2.2 Monitoring Conditions

The objective of the Ivy Gap Branch Site N stream restoration/relocation was to restore a B4c stream as identified in Rosgen's Applied River Morphology. A total of five cross sections (three in a riffle and two in a pool) were surveyed. For this report, only cross sections containing riffles were used in the comparison of channel morphology presented below in Table 1 (Site I).

Table 1. Abbreviated Morphological Summary (Ivy Gap Branch Site N)

Variable	Proposed	Cross-Section #2 (Riffle)	Cross-Section #4 (Riffle)	Cross-Section #5 (Riffle)	Min. – Max Values (Riffle Sections Only)
		2012	2012	2012	2012
Drainage Area (mi ²)	1.14	1.14	1.14	1.14	1.14
Bankfull Cross Sectional Area (ft ²)	12.8	20.96	20	35.43	20 – 35.43
Maximum Bankfull Depth (ft.)	1.3	2.85	2.64	2.69	2.64 – 2.85
Width of the Floodprone Area (ft.)	10.0	22	25	35	22 – 35
Bankfull Mean Depth (ft.)	1.03	1.41	1.55	1.62	1.41 – 1.62
Width/Depth Ratio	12	10.52	8.31	13.46	8.31 – 13.46
Entrenchment Ratio	1.7	1.48	1.94	1.6	1.48 – 1.94
Bankfull Width (ft.)	12.4	14.84	12.88	21.81	12.88 – 21.81

* Riffle values are used for classification purposes, pool values are shown in Appendix A.

2.3 Results of the Stream Assessment

2.3.1 Site Data

The assessment included the survey of five cross sections and the longitudinal profile of the Ivy Gap Branch Site N established by NCDOT after construction. The length of the profile along the Ivy Gap Branch Site N was approximately 593 linear feet. Five cross sections were established during the as-built monitoring year. Cross section locations were subsequently based on the stationing of the longitudinal profile and are presented below. The location of the cross sections and longitudinal profile are shown in Appendix A.

Ivy Gap Branch Site N Cross-Sections:

- ◆ Cross-Section #1: Ivy Gap Branch Site N, Station 133+00, midpoint of pool
- ◆ Cross-Section #2: Ivy Gap Branch Site N, Station 214+50, midpoint of riffle
- ◆ Cross-Section #3: Ivy Gap Branch Site N, Station 236+00, midpoint of pool
- ◆ Cross-Section #4: Ivy Gap Branch Site N, Station 356+50, midpoint of riffle
- ◆ Cross-Section #5: Ivy Gap Branch Site N, Station 704+00, midpoint of riffle

Based on comparisons of the As-Built to the monitoring data, all of the cross sections appear stable with little or no active bank erosion. Graphs of the cross sections are presented in Appendix A. Future survey data will vary depending on actual location of rod placement and alignment; however, this information should remain similar in appearance. The longitudinal profile showed that the channel was stable for the 2012 monitoring evaluation. Pebble counts were not required per the permit conditions and therefore were not completed.

3.0 VEGETATION: IVY GAP BRANCH SITE N

3.1 Description of Species

The following tree species were planted on the streambank:

Salix nigra, Black Willow

Cornus amomum, Silky Dogwood

The following tree species were planted in the buffer area:

Liriodendron tulipifera, Yellow Poplar

Platanus occidentalis, Sycamore

Fraxinus pennsylvanica, Green Ash

Quercus alba, White Oak

3.2 Results of Vegetation Monitoring

Streambank & Buffer Vegetation: The streambank reforestation was completed in March 2012. The Year 1 vegetation monitoring evaluation noted: Type I: Black Willow, Silky Dogwood and Type II: Sycamore, Green Ash, Tulip Poplar, and White Oak were surviving at the time of the monitoring evaluation.

3.3 Conclusions

NCDOT will continue to monitor the planted vegetation in 2013.

4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS

The Ivy Gap Branch Site N Mitigation Site has met the required monitoring protocols for the third formal year of monitoring on the stream and the first formal year of monitoring on the planted vegetation. The channel throughout the stream relocation site is stable and the planted vegetation is surviving at this time. NCDOT will continue monitoring the Ivy Gap Branch Site N Mitigation Site in 2013.

5.0 REFERENCES

Stream Mitigation Plan, US Highway 19, R-2518A On-Site Mitigation
Madison County, North Carolina, August 2006.

Design Plans for R-2518A, US 19 from I-26 to 0.8 KM east of the Yancey Co.
Line, Stream Mitigation (Preservation, Enhancement, and Restoration),
HSMM.

North Carolina Department of Transportation (NCDOT), April 29, 2008. 404 and
401 Individual Permits for R-2518A and R-2518B (ACOE Permit No. 2007-
2197-357/300 and DWQ Project No. 20071134, Individual Certification No.
3706).

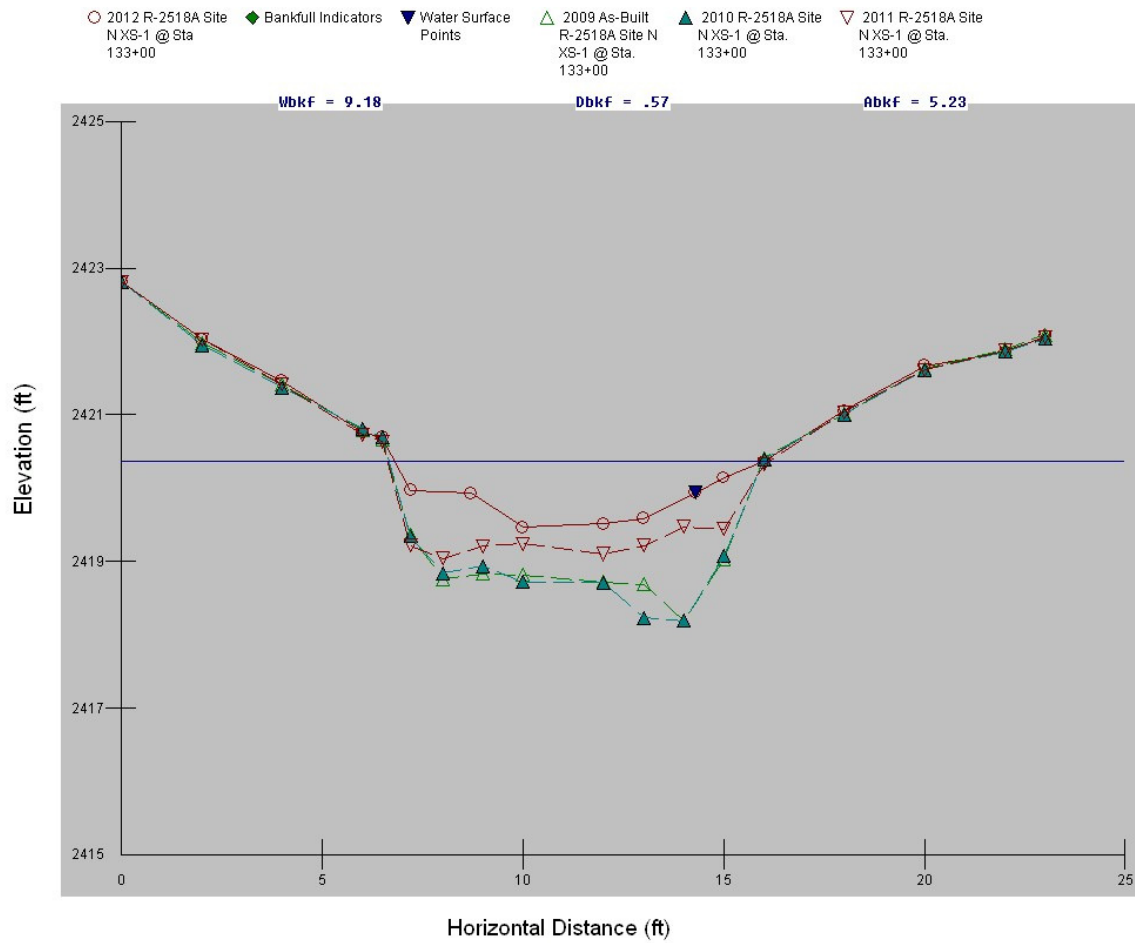
Rosgen, D.L, 1996. Applied River Morphology. Wildland Hydrology, Pagosa
Springs, Colorado.

US Army Corps of Engineers (USACE), 2003. Stream Mitigation Guidelines.
Prepared with cooperation from the US Environmental Protection Agency,
NC Wildlife Resources Commission, and the NC Division of Water Quality.

APPENDIX A

CROSS SECTIONS AND LONGITUDINAL PROFILE

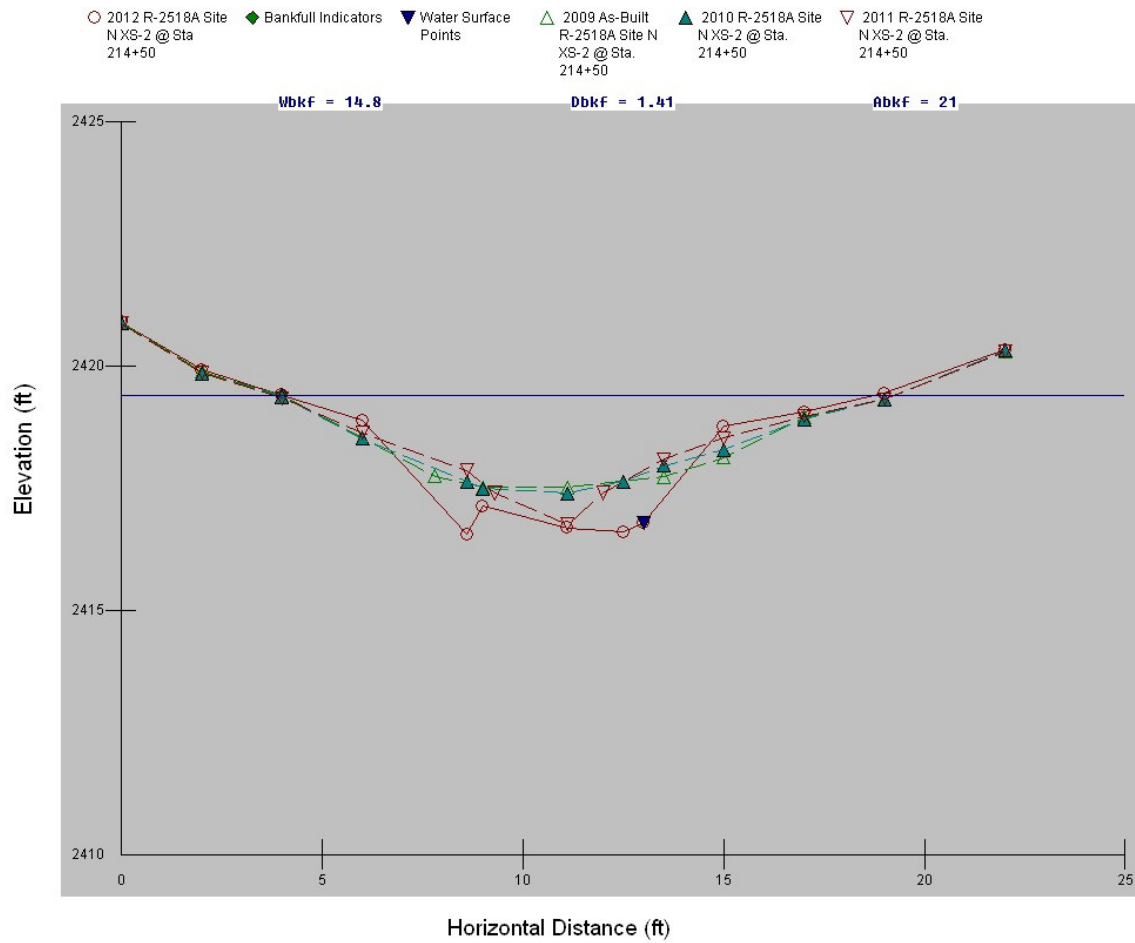
R-2518A Site N XS-1 @ Sta 133+00



Site N: Cross-Section #1 (Pool) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft ²)	14.26	12.34	5.23		
Maximum Bankfull Depth (ft.)	2.2	1.59	0.9		
Bankfull Mean Depth (ft.)	1.53	1.19	0.57		
Bankfull Width (ft.)	9.34	10.37	9.18		

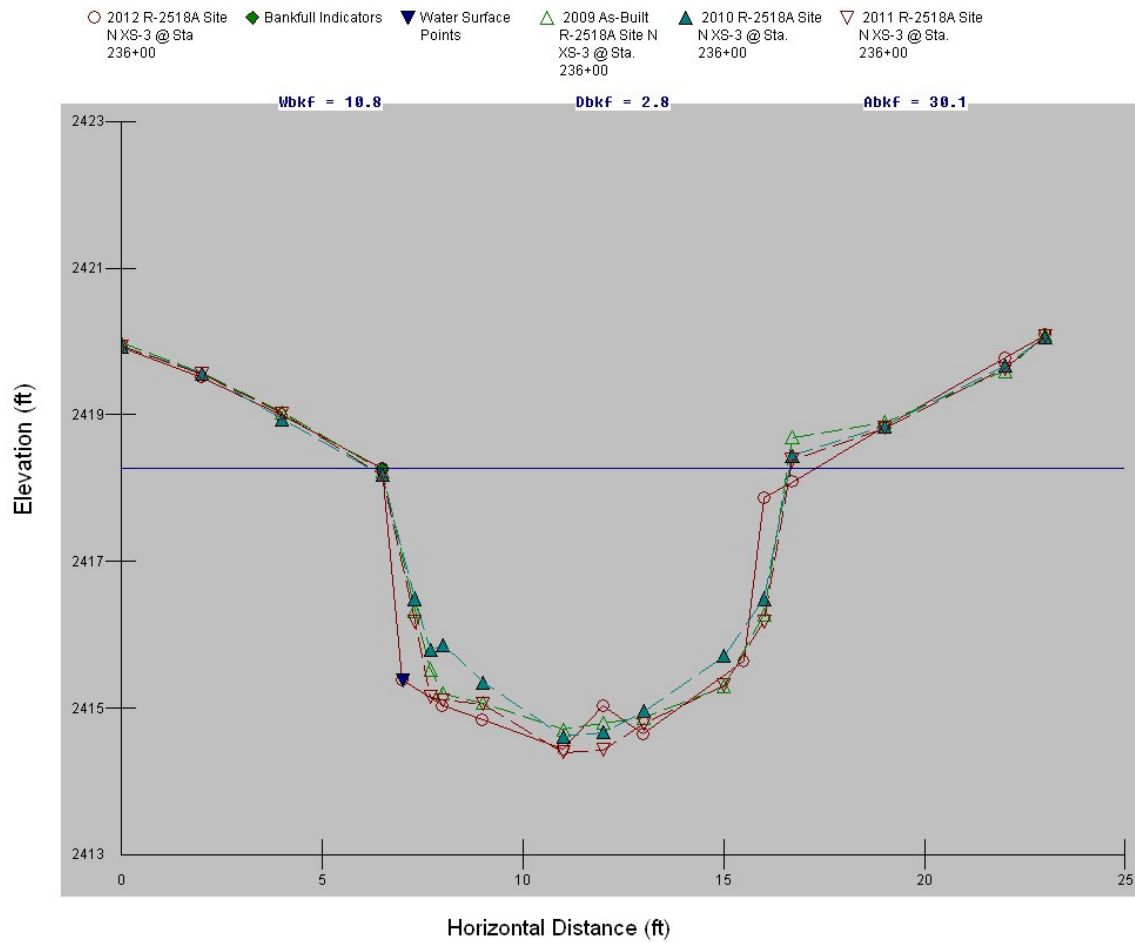
*According to the Rosgen Classification of Natural Rivers floodprone width, entrenchment ratio, and width depth ratio are not measured in pool, glide, or run features.

R-2518A Site N XS-2 @ Sta 214+50



Site N: Cross-Section #2 (Riffle) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft ²)	17.17	11.37	20.96		
Maximum Bankfull Depth (ft.)	1.98	2.21	2.85		
Width of the Floodprone Area (ft.)	22	22	22		
Bankfull Mean Depth (ft.)	1.13	0.95	1.41		
Width/Depth Ratio	13.43	12.59	10.52		
Entrenchment Ratio	1.45	1.84	1.48		
Bankfull Width (ft.)	15.18	11.96	14.84		

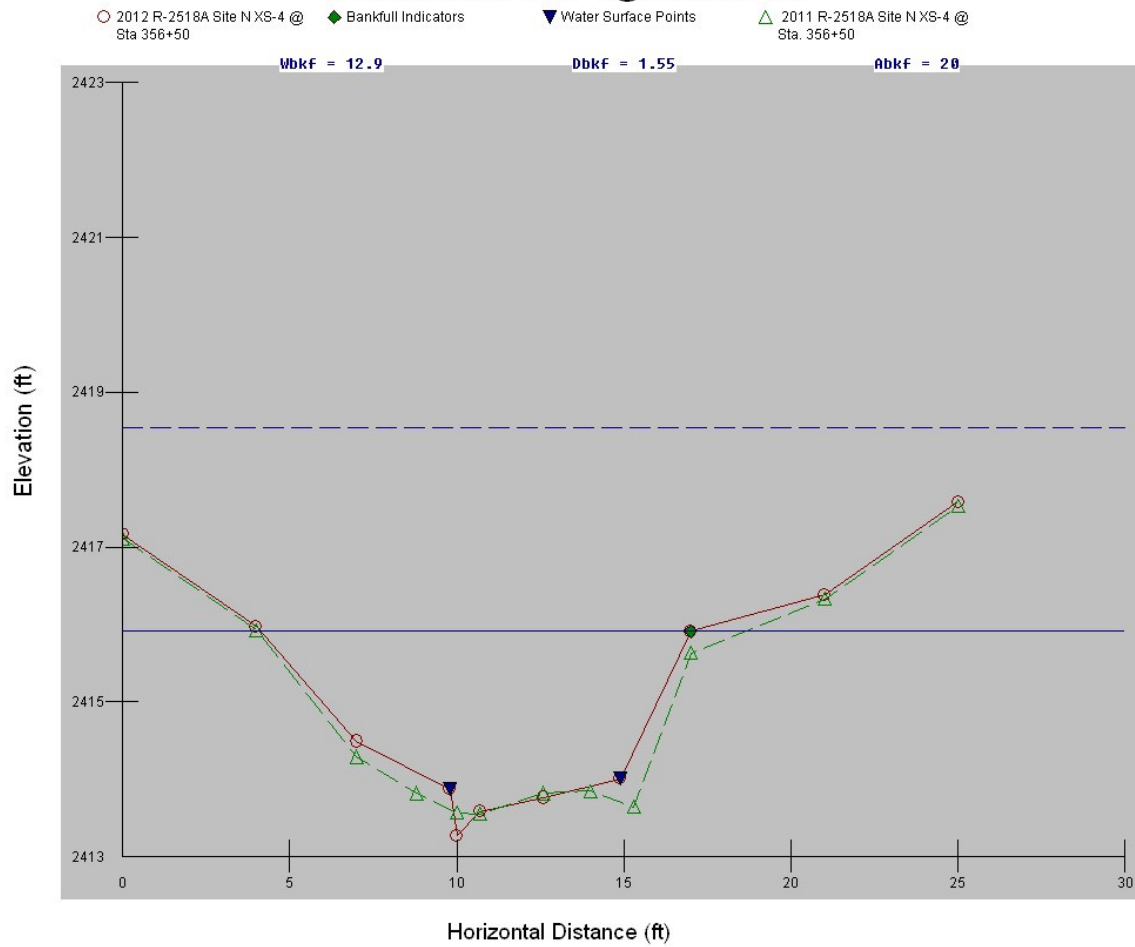
R-2518A Site N XS-3 @ Sta 236+00



Site N: Cross-Section #3 (Pool) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft ²)	26.36	29.4	30.1		
Maximum Bankfull Depth (ft.)	3.57	3.78	3.82		
Bankfull Mean Depth (ft.)	2.61	2.9	2.8		
Bankfull Width (ft.)	10.11	10.14	10.75		

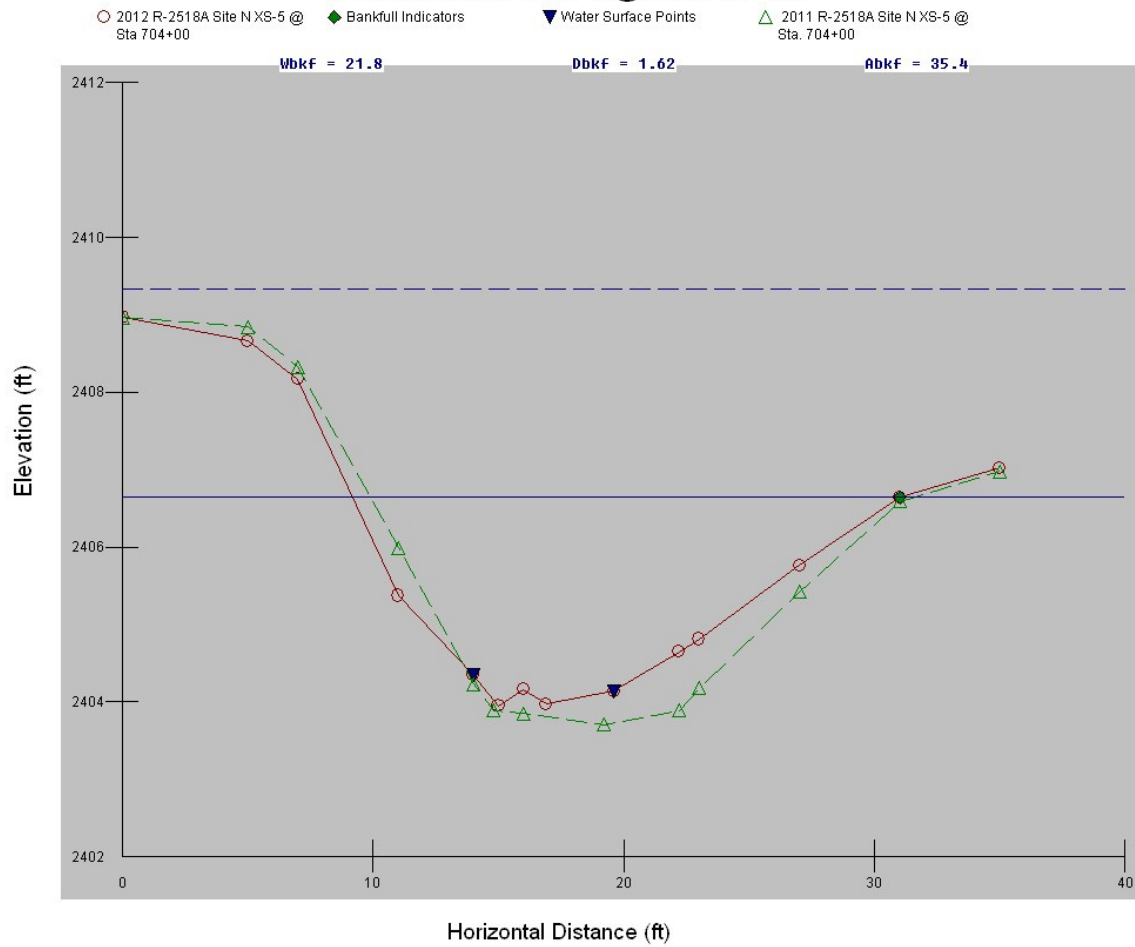
*According to the Rosgen Classification of Natural Rivers floodprone width, entrenchment ratio, and width depth ratio are not measured in pool, glide, or run features.

R-2518A Site N XS-4 @ Sta 356+50



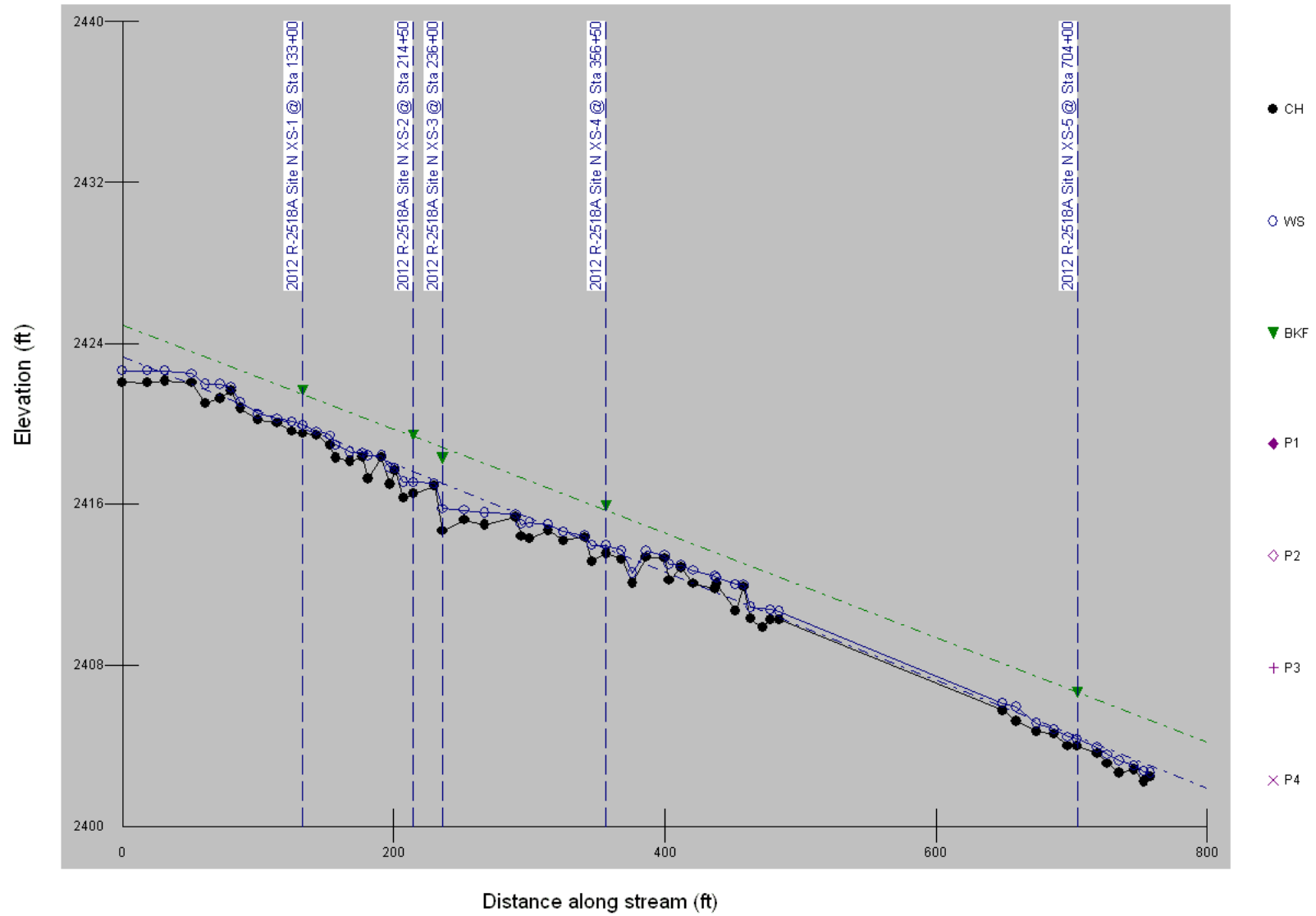
Site N: Cross-Section #4 (Riffle) Abbreviated Morphological Summary				
	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft ²)	18.6	20		
Maximum Bankfull Depth (ft.)	2.08	2.64		
Width of the Floodprone Area (ft.)	25	25		
Bankfull Mean Depth (ft.)	1.49	1.55		
Width/Depth Ratio	8.36	8.31		
Entrenchment Ratio	2.01	1.94		
Bankfull Width (ft.)	12.45	12.88		

R-2518A Site N XS-5 @ Sta 704+00



Site N: Cross-Section #5 (Riffle) Abbreviated Morphological Summary				
	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft ²)	38.94	35.43		
Maximum Bankfull Depth (ft.)	2.88	2.69		
Width of the Floodprone Area (ft.)	35	35		
Bankfull Mean Depth (ft.)	1.85	1.62		
Width/Depth Ratio	11.37	13.46		
Entrenchment Ratio	1.66	1.6		
Bankfull Width (ft.)	21.03	21.81		

R-2518A Site N Profile



APPENDIX B

SITE PHOTOGRAPHS AND LONGITUTINAL PROFILE

Ivy Gap Branch Site N



Photo Point #1 (Upstream)



Photo Point #1 (Downstream)



Photo Point #2 (Upstream)



Photo Point #2 (Downstream)



Photo Point #3 (Upstream)



Photo Point #3 (Downstream)

November 2012

Ivy Gap Branch Site N



Photo Point #4 (Upstream)
November 2012



Photo Point #4 (Downstream)

Ivy Gap Branch Site N



Vegetation Overview Photo (Looking Upstream from US 19)



Vegetation Overview Photo (Looking Downstream from US 19)

September 2012